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# Exploring Historical Space and Environments in the History/Social Studies Classroom: Discussion and Reflections

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## Introduction

The follow-up discussion below is organized around seven headings:

1. GIS: The Payoffs
2. A Cross-cutting Issue: GIS and/or Spatial Literacy?
3. Other issues/opportunities involving GIS in the History Classroom
4. Cautions, Problems & (Partial)Solutions
5. On-Line Exemplars of Historical GIS
6. Further Reading/Research on Using GIS in the History Classroom.
7. Data Sources and Recommendations

In some cases, discussion has been further organized under sub-headings to provide continuity, but I have attempted to cluster each individual's comments in one place to facilitate reading and to allow readers to clearly identify individual reactions and opinions.

## I. GIS: The Payoffs

Ruth Mostern:

- GIS allows students to think about time and space simultaneously in ways that are not possible with other media/approaches.
- GIS allows/encourages students to explore how (and why) human activity varies spatially, and what kinds of environments are conducive to particular kinds of activities. Visualizing historical phenomena that take place in space—from battles, to migrations, to voting patterns, to urban growth, to climate change, to the scope of cultures – greatly enhances student understanding of these phenomenon and allows them to conduct their own original analyses.
- One payoff for incorporating GIS into history education—and into our own research as well—lies in opening the door to quantitative analysis for the humanities, and in using quantifiable information to answer real research questions. Too easily our (intended broadly) discussions fall back on “discovery” and “visualization,” but increasingly I believe that even students (upper division and grad, at least), even with simple technology, even with small datasets, can—and must—do real analysis about the spatial correlations among identifiable variables. Just as one example, let me cite Franco Moretti’s amazing book *Graphs, Maps and Trees* (available at [http://www.worldcat.org/oclc/60671819&referer=brief\\_results](http://www.worldcat.org/oclc/60671819&referer=brief_results)), which profoundly influenced my thinking about what GIS is good for in history and the humanities more generally. Moretti, a literary critic, introduces a method that he calls “distant reading,” and makes the best case I have ever seen – \_bar none – for the value of quantitative work in the humanities for producing new research findings. In three successive chapters, and with no tool more complex than Microsoft Excel, Moretti generates eye-opening new knowledge about three topics in nineteenth century literature: the evolution of the publishing industry as seen from changes in title lengths, the impact of the railroad on the British countryside as seen through the changing content of one prolific author, and the solidification of genre conventions as seen through the history of the detective novel. For each chapter, Moretti develops a clever but very tidy dataset organized around a clearly defined humanities/history research question, some of which have clear geographic implications suggestive for the use of GIS.

**Jim Brown:**

- GIS does a great deal to enhance classroom presentations and to promote active student learning. In my world history survey course, and increasingly in my advanced history courses, I either give a GIS presentation in parallel with lecture, or make it available to students on-line. However, I’ve abandoned ArcGIS almost completely, and gone to Google Earth.

- Most important of all – and this has been written about by others – GIS reveals patterns spatial relationships in history with a visuality that is simply stunning. Recently I spent an hour or so converting Lucy Dawidowicz’s map of the four Einsatzgruppen charged with eliminating eastern European Jews into four separate Polygons in Google Earth. I colored them red, and called in my three neighboring history colleagues to see the results. I displayed the four layers one at a time, with the software subtly changing focus to pre-set map views. They all now want an informal seminar to teach them how to do this.
- I once heard that the best technique for self-education in cultural history was to “read, travel, read, travel, and repeat.” Virtual travel of the GIS kind, including reference to relevant Panoramio icon photos, etc., is the next best thing.
- All of my presentations have grown out of a feedback cycle between Google Earth and the written word. My weak students seem to learn more this way, and my best students take off into their own feedback loop.
- For the end-of-term research project I get a classic research paper, but the class gets a Google Earth presentation. For the first time in my 37-year-long teaching career students are genuinely interested in each other’s presentations!

**Barry Robinson:**

- GIS has greatly enhanced my own presentations, particularly the creation of visuals to accompany lectures; I’ve only just begun to tap into this but am very excited. As Jim mentioned, student presentations using Google Earth can be much more appealing and engaging than otherwise. (I haven’t yet had students develop a presentation from start to finish in ArcGIS, so I can’t comment on its utility.)
- As discussed in the draft of my article for the JAHG, incorporating a GIS-based class project into one of my courses served as a very useful platform (and motivation) for student ownership of the learning process.

**Steven Branting:**

- GIS wonderfully visualizes the substance of specific topics under investigation and creating original geographic visuals for use in or by the class. This applies especially to spatial patterns but is not limited to them.

- GIS can greatly enhance creative solution-finding by students when teachers provide them with challenging prompts. It enhances students' creation of their own demonstration elements for PowerPoint displays, display boards, etc.
- As a tool, it addresses a number of Bloom's Taxonomy of Higher Levels of Thinking through idea mapping, demonstration of the synergy of disciplines (e.g., GIS mapping to answer demographic queries), etc. Benjamin Bloom (1956) classified educational objectives into six (6) hierarchical categories: **knowledge, comprehension, application, analysis, synthesis, and evaluation**. I build (albeit without much thought after more than 30 years experience with the taxonomy) learning activities and experiences around this hierarchy. For example, as a student begins his work with GIS, I start with basic functions and their relationship to the icons associated with them, providing the students with some rationale for the "shape" of the GIS architecture (why is it put together this way?). In GIS, icons, tools, layers, themes, functions are all **knowledge**-based. The next step – **comprehension** – requires questioning focusing on technique and demonstrations on the student's part that he can replicate a solution that had been modeled. The "**application**" of knowledge occurs most frequently when I progress to the point where a GIS situation/problem can be related to the student for them to formulate a solution.

These first steps in the taxonomy are "lower level" activities, as they reflect a student's repetition of training examples and modeled behaviors. However, the next level – the so-called "higher cognitive skills – make more demands on student abilities to make connections, understand relationships, and so on. **Analysis** can be introduced with review questions during and after function demonstrations, with queries such as "What are some reasons you can give for why these data sets do not match at low scale settings?" Analysis questioning (or opportunities for analyses to take place) encourage students to find "reasons" for the displays they are building in GIS. Assignments can lean heavily toward analysis. By way of an example, we ask in one assignment: "What conclusions can you reach regarding the locations of American volcanoes relative to the topography of the United States?" **Synthesis** allows the student to create a solution based on some limited (but necessary) parameters laid down by the teacher. An example: "Given the African habitat ranges of the chimpanzee and giraffe, create a map demonstrating the importance of landscape on their shared environment." Lastly, at the **evaluation** step, the student can appraise, assess, compare, contrast, etc. I pose technique questions to spur this level of thinking, such as "Which procedure do you feel is more accurate (friendly, efficient, etc.)?" Our students have used both ArcGIS and My World architectures and compared them on the bases of their functions,

displays, ease of operations, etc. We regularly discuss the differences as new skills are introduced.

All of these comments apply to teachers as well, as they train in GIS in our college courses offered at our junior high school:

GIS I: ArcGIS

GIS II: My World  
<http://www.lewiston.k12.id.us/staff/sbranting/MyWorld/my1.htm>

GIS III: Spatial Data Analysis  
<http://www.lewiston.k12.id.us/staff/sbranting/MyWorld/my12.htm>

- GIS can be effectively employed to develop authentic learning situations for classrooms, situations that entail students investigating problems and finding solutions where the tools and data employed reflect a real-world use. Regardless of how astute and creative a teacher may be in writing meaningful GIS assignments and activities for the classroom or computer lab, there is a break-point at which students need to expand their understanding of GIS's role in the real world. To accomplish this, I arrange for some students to work with the county GIS office during summer break, conduct standard positioning studies with student assistants, teach seminars in GPS technologies to science students to give them experience in developing metadata, and integrate total station surveying (and geoprocessing) into our archaeological field work. Additionally, we annually open our work to the public in GPS and GIS studies.
- GIS allows me to take teachers and students into challenging intellectual realms I would not otherwise be able to explore with them. For example, with GIS as a foundation, I have been working with a teacher to design activities using buffers to calculate probabilities of certain phenomena occurring within a preset distance from a major river – all for use in pre-collegiate classrooms. It is hard to imagine doing this in an environment other than a GIS.
- I have readily integrated historical and data sources into project planning as I design curricula, especially for field work in the social, life and earth sciences. We focus on cross-disciplinary activities, an approach for which GIS is ideally suited.

GIS allows flexible re-combining of data set libraries into new applications to enrich classroom studies. Our 8th grade Social studies teachers are focusing on the Lewis & Clark Corps of Discovery and territorial acquisitions with data libraries developed

for the teacher specific to their curriculum needs. This is an important element in using GIS and a major topic for teachers and GIS planners/coordinators: creating in-house data libraries that serve the school's needs. For example, the following two libraries now consist of multiple data sets, and these could be further combined into still other libraries:

1. Lewis & Clark data library: a. 1783 treaty boundaries, b. British Canada, c. Spanish Mexico, d. key mountain passes, e. Louisiana Purchase, f. campsites of the Expedition, g. United States cities in 1803, h. the route of the Expedition (both westbound and eastbound), i. Continental Divide

2. United States territories data library: a. All territorial acquisitions from 1783 – 1917 (Virgin Islands). These include the Mexican Cession, Oregon Territory, Alaska, Texas, etc. Each acquisition can be investigated (queried) individually.

Data layers of territorial acquisition can be laid over state boundary maps to analyze the placement of states. For example, there is a misconception among many in Idaho that the state was part of the Louisiana Purchase. It was not. However, Lewis & Clark travels across the Panhandle. Indeed, they camped less than 2 miles from my house on October 5, 1805.

#### **Jack Owens:**

At the graduate level, the use of GIS provokes valuable discussions about

- what variables are important for shaping change and movement in human communities
- the nature of narrative and about its importance for knowledge creation, about understanding history within the context of complex human and natural systems (including climate)
- the systemic transformations that account for historic periodization
- linear and nonlinear dynamics in history.

These topics pop up because of the deficiencies of current GIS software, of which the students become familiar. In confronting these difficulties (spelled out further below), the students are forced to think carefully about such fundamental issues of historic understanding as how to connect the different concepts employed by professional historians. In doing so, they begin to imagine the spatio-temporal GIS they want for the future and various means to reach that goal. This sophisticated methodological and theoretical thinking are "payoffs" of the use of GIS that are well

worth noting. (Wow, my students had better be in top form on Tuesday night because I just set some pretty high standards for class. Their written assignment for the following class is a memo in which they discuss how they would incorporate religion into a GIS framework. Of course, they will have to think about what they mean by "religion". Sound fun?)

## **II. A Cross-cutting Issue: GIS and/or Spatial Literacy?**

**Ruth Mostern**, who has written broadly on GIS in historical studies and also in more technical venues about the challenges and opportunities posed by her efforts to use GIS in research and teaching, thought it important for readers to consider the following question:

One question I would like to raise is whether we should be talking only about "GIS in the History Classroom", or whether we should be talking about "spatial literacy in the history classroom," with GIS as one possible component of that. In many settings (a lower division class with a lot to accomplish in a short time, or a class on a subject for which spatial data does not exist already, for instance), there are other lower-bar technologies and approaches that might be more valuable. For instance, students might be introduced to spatial scale via an assignment based on Google Earth (which I use in my World History introduction), and students in an upper division or grad class might be asked to design a digital gazetteer based on historical materials, an assignment that I gave to great effect. (Paper maps and atlases are a great resource that in many ways, and for many historical phenomena, supersede anything currently available in GIS.) I think of GIS per se as a particular and specialized technique that--in spite of the fact that the bar is much lower than it was in past years--is still a tool that in many circumstances can get in the way of thinking about the relationship between history and geography. In some circumstances, approaches such as those I have noted promote spatial literacy and increase historical understanding using tools other than GIS.

**Jack Owens**, too, has had students engage in developing gazetteers as a device to teach students a greater awareness of the spatial facets of historical study. His sense of the spatial dimension of history – again, clearly linked to his research focus on early modern trade in the Spanish Empire – led him to GIS as an important tool for exploring the impacts of space on the evolution of a colonial empire. J. B. Owens, "Routes: Teaching About Connections in World History." *History Computer Review*, 19 (Spring 2003): 69–73, discusses student projects that



result in GIS-compatible data sets and gazetteers to promote spatial literacy in history courses. He notes,

Although it specifically addresses one of my courses, I use the same type of assignment, focused on the distribution of printed books, for a course entitled Renaissance Creativity. One of my undergraduates is the lead author for a data notation manual for this project, Blarer, Dean K., T. Matthew Ciolek, and J. B. Owens, "Notation system for data about the spatial distribution of hand-press printed books, 1450–1830" (ver. 2.4; in preparation for web publication). In addition to the spatial issue raised in the title, the manual also discusses the development of digital gazetteers. Although the odd graduate student has taken these courses, they are designed for upper-division undergraduates. My assessment has consistently shown that these projects result in much greater student understanding of the complexity of the themes addressed in these courses because they take into account the way that places were connected, how these connections changed over time, and the degree of spatial variation, for which they have to offer explanations based on understandings of how place and the connections among places shape change and movement in human communities.

To train undergraduate history majors for teaching in pre-collegiate programs (about half the majors) Jack and his colleagues have included spatially-related learning objectives as part of a broader set of "historical thinking objectives" to guide course creation and content. The objectives most directly related to this goal are [emphasis added, PCB]:

Understand historical events in their **global context**

**Understand how places are connected** (for example, by economic, political, and cultural links) **and analyze how these interconnections have changed** over particular periods

Understand regions as historical entities, **including change in their spatial dimensions and characteristics** over time

**Understand cartographic representations of spatial features and relationships** and of historical developments

Understand how local developments are linked to **regional or global themes**

Understand bias and points of view in primary and secondary sources, including in images, documentary films, **and cartographic representations**

Jack notes, "Spatial literacy can also be important for dealing with the other objectives. Once historians recognize the importance of spatial literacy for dealing with the problems raised in their courses, there are no real limits to how spatial concerns are introduced into all courses. The general impact on the general education of ISU students of our approach his great. To satisfy one of the general education goals, most ISU students take a course from within the group of our courses we entitle "World Regions" to stress their emphasis on place."

**Steven Branting's** observations suggest the possibility that one's home discipline (history or geography) has an influence on how one approaches this question. His emphasis is on the value of GIS in promoting spatial awareness:

One starts with technique, much as in archaeology or forensics. After a mastery of technique is achieved, creative solution-finding can begin in earnest. Think of GIS as a tool which refocuses the dynamics of history into a spatial perspective.

**Philip Brown's** experience tended to reflect this approach. He originally began with a research problem – trying to assess the influence of the natural environment on a form of joint village landholding in Japan – that he did not immediately think of as a "spatial" issue. That awareness came as he learned to work with GIS, even when that exposure was minimal and very basic.

**Jim Brown** notes that a good part of his use of GIS involves geo-rectifying scanned map images so they can be linked or overlaid in a GIS, one on top of the other, or from which teachers and students can generate new geographic data to permit analysis that would be difficult, if not impossible, with two separate paper maps – a procedure that clearly enhances student awareness of spatial interactions.

Our brief discussion suggests two cautions for readers:

- 1) Spatial literacy, GIS literacy, and the role of space in historical study are all distinct, but related realms of activity. It is helpful to avoid confounding them. One can accomplish goals in one realm without necessarily engaging the others broadly. One can employ non-technical, non-GIS approaches to both spatial literacy and the role of space in historical study, yet there is also no doubt that the use of GIS can stimulate an awareness of the importance of space and its role in promoting historical understanding where that awareness did not already exist.
- 2) By implication, in planning classroom activities, it is helpful to reflect on the specific objectives one has in mind. Is the goal to promote some element of

spatial awareness that is present in either national standards for social studies and history education? Giving students a chance to explore sophisticated relationships through GIS software and teacher-provided data sets, thereby providing an opportunity to go beyond textbooks and actively engage in historical research that would otherwise be unavailable? Or are students being asked to re-evaluate their own assumptions about spatial relationships in ways that can take advantage of materials readily at hand, e.g., thinking about the problems of communication and projecting power over substantial distances prior to development of the telegraph and steam locomotion?

While participants, especially **Barry Robinson**, recognize the importance of spatial literacy, they were reluctant to explore that field more fully at this time. Nonetheless, readers might want to begin their own consideration of spatial literacy by exploring 1) the social studies curriculum guidelines for their own state, 2) the *National Standards for History Basic Edition*, 1996, available on line at National Center for History in the Schools (UCLA), <http://nchs.ucla.edu/standards/> and 3) Committee on the Support for the Thinking Spatially: The Incorporation of Geographic Information Science Across the K-12 Curriculum, Committee on Geography, National Research Council, Learning to Think Spatially: GIS as a Support System in the K-12 Curriculum (2006), The National Academies Press, Washington, DC.

### **III. Other issues/opportunities involving GIS in the History Classroom**

#### **Broad, Cross-disciplinary Collaboration**

GIS provides a number of outstanding opportunities quite apart from its ability to add a new dimension to student learning and analysis. It provides an environment for cross- and inter-disciplinary collaboration among a wide range of specialties.

“GIS across the curriculum,” All subjects that have a mathematical component (demographic, geometrical, et. al.) have a spatial capacity for classroom study and use of GIS in solution-finding. (Steven Branting)

**Ruth Mostern**, working in a broadly interdisciplinary program rather than traditionally defined disciplinary departments, sees this potential for pan-disciplinary work as a clear opportunity, but one that calls for proselytization via demonstration: “We need to work collaboratively in our institutions to make some of the suggestions for developing GIS in the classroom actually happen. The more articles and exemplars we can pass along to colleagues to demonstrate what we’re trying to accomplish, the better.”

**Steven Branting** goes a step further:

My experience of more than 38 years in the K-12 environment has convinced me of two (2) things: (1) Teachers (or administrators for that matter) more readily accept and utilize new technologies when they learn it in conjunction with their immediate needs; and (2) a sense of vested interest is very important. When teachers feel a sense of ownership, they can and will find a place for technologies like GIS. Our teachers have done so with great enthusiasm when it clearly addresses their pedagogical needs.

#### **The Value of Field Work (Steven Branting)**

Specialized field work opportunities are crucial for top GIS students. The challenge lets them shine. Classrooms can work with GPS units to explore spatial geometry, but truly inventive projects will be more exclusive to highly motivated and skilled students, skills for which are developed in the field, a setting that also excites and motivates them. Two such GIS projects we are undertaking in the next few months are (1) the embalming arsenic and soil leaching survey; and (2) the archaeological field school. Both activities have GIS components for student assistants (this year, incoming 9th graders) to use total station surveying in an archaeological setting, geoprocessing that data to aerial images of the field sites. (Our archaeology field simulation, which includes a total station surveying and GIS processing component, is now in its preliminary stages: <http://www.lewiston.k12.id.us/staff/sbranting/afs/afs1.htm>)

#### **IV. Cautions, Problems & (Partial)Solutions**

**Some General Limitations of GIS for Historical Study:** **Jack Owens** notes three widely-recognized issues that arise in using any GIS for historical learning and study:

Despite the use of software such as TimeMap and other temporal GIS software that has been developed, GIS is still much too static, and is limited in its ability to work with processes that unfold over time. Especially at the level of statistics of even a relatively basic nature, its temporal capabilities are much too weak for the effective organization, analysis, and visualization of data for knowledge creation. It can be cumbersome to call up (query) the data one wants to display.

Second, current GIS software does not permit the user to deal simultaneously with the interactions of more than a few variables.

Third, many historic data are vague, contradictory, incomplete, highly uncertain, and otherwise messy. In contrast, display and analysis in a GIS demands a high level of precision and fixity. Our contemporary understanding of political administrative boundaries suits a GIS relatively well, for example, but not the sense of boundaries as understood in pre-modern East Asia, where overlords dealt with population centers but not the boundaries (often malleable and ill-defined) of the territories over which those centers exercised control (often in collaboration with neighboring communities). As such, important historical data may be difficult to accommodate within the precision-oriented GIS environment.

**Programmers, technical wizards, and users:** Steven Branting observes, “In GIS one finds two camps: geographers and programmers. The geographers see GIS as a tool to template the world around us; programmers view it as a digital landscape to be manipulated with the intricacies of computer code. The two camps do not have a common vision at this point.”

Here, readers should interpret the reference to “geographers” very broadly: anyone who uses a GIS is practicing “geography” at some level. So the problem Steven indicates suggests a broad issue that affects the ability of any user to get the GIS functions that she desires. Users need to be prepared to make trade-offs in selecting the software they use and may have to rely on more than one software to get the full range of functions on which they wish to capitalize.

**Spatial Literacy vs. GIS Literacy, Redux (Ruth Mostern):** “I would like to remind people of a distinction I have made elsewhere in our discussion: In many classrooms, spatial literacy is the goal, GIS is one of the means. In addition, where GIS literacy is the goal, historical data might be the means. But these approaches must be distinguished from one another because the pedagogical strategies they imply are very different.”

### **Getting/Creating Content for Classroom GIS Use**

**Steven Branting:** Content is a *sine qua non* issue. GIS is of no value in itself if the discipline is isolated from authentic problems for students to solve in unique and personal ways. All lessons must have a curriculum link, not a GIS link. While some of my students have gone on to GIS work in university, the majority see GIS as a creative tool, especially when using query and geo-processing functions.

Building data libraries is not all that difficult; we do it at the junior high school level in

response to teacher needs. Our Lewis & Clark Corps of Discovery library is very extensive and was created in just a few minutes... and added to our lab in less than 20 minutes. GIS spatial data is so extensive that we build libraries on many special topics.

**Ruth Mostern:** A bigger problem: CONTENT, CONTENT, CONTENT. As a specialist in Chinese history and pre-1500 World History, I can say that there is simply almost no existing spatial data available. Developing data is difficult and expensive, and until some publisher, funder, or scholarly consortium takes the lead in making it available, all that will be out there is a few anecdotal projects, few of which are tailored to particular classroom exercises.

The only possible solution--beyond the long term one of writing proposals, gathering collaborators, securing funding, designing appropriate systems, and doing it ourselves--is to assign students projects that require them to create their own data and then use it for some purpose. I have done this in a small way--with gazetteer design and with Google Earth--and that is the tack that I expect to continue pursuing.

For **Barry Robinson**, it is precisely this latter course which is preferable: "I think we should have our students create their own content/data wherever possible, and promote projects that pool freely-accessible data online in the meantime."

**The Challenge of Documentation:** In this regard, as one last note, somewhere we need to emphasize the importance of documenting the sources of our maps. Such documentation probably should appear both in the text in the GIS layer itself, and in a footnote to any parallel document in text. Such documentation probably ought to include a couple of things: first, as careful a citation of maps used as sources as historians would customarily use in footnoting articles, books, documents, etc., and second, at least a short description of how the historian using GIS handled the map, or blended two or more map sources. If the basic purpose of a reference footnote is to enable readers to check out the source or sources on their own, we arguably need the same level of honesty and transparency in GIS mapping. I know I have often found myself, in the process of "interpolating" some missing data when converting a digitized paper map to a GIS layer, failing to embed a description detailed enough for a viewer to know how much the map is to be trusted, or what parts of it are more trustworthy.

### **Challenges to Teachers/Students in Learning to Use GIS Software:**

**Philip Brown:** In the early days of personal computing (I know, I date myself!) it was

commonly said that software should be a) cheap, b) functional and c) easy to learn – and users can have any TWO of these in a given software package. This is especially true in the context of GIS software, and, as our authors observe, the issue of “ease of use” remains among the greatest challenges, with improvements having come in the realms of software price (usable packages are now available for free or low cost) and increased functionality.

**Jack Owens** observes, “The technology is still difficult to master, which is a serious defect in any information technology that should be employed widely.

**Barry Robinson** adds, “The technical learning curve for ArcGIS is especially challenging.”

**Jim Brown** notes in particular that “3-D imagery with ArcGIS was way too difficult and time consuming. Even after five years of training in ArcGIS there were certain kinds of data I never learned to import properly, so I remained dependent on the spare time and goodwill of our one campus GIS professional.

While the challenges are significant, “GIS is geography for the 21st century. No math teacher would think of expending classroom time attempting have his students master a slide rule. Now personally, I enjoy the instrument and do teach seminars in slide rule use – but a graphic calculator is a “*de rigeur*.” Likewise, all social studies, environmental science, geology, geography and earth sciences teachers do well to consider and remediate their deficit if they do not have GIS skills. (**Steven Branting**)

The challenges have implications for program development as well as for the acquisition by individual teachers and students. Overcoming the learning curve challenge is essential to promote the critical objective of generating in teachers

a sense of shared ownership. Basically, faculties within a school need to feel that GIS is my skill, not the GIS instructor’s skill. Too often I have seen good programs die in the K-12 environment because ‘he is no longer teaching here.’ Why do valuable curricula often fade? Because there was not enough buy-in among the faculty. (**Steven Branting**)

As **Jim Brown** hinted, the technical demands of some GIS software reduce teacher autonomy and make heavy demands on a GIS coordinator, a pressure felt at that end, too: “Too much dependence on me as the GIS provider in the initial stages — a consequence of some “terminal phobia” limits my ability to advance other elements of our learning program.” However, technological demands of some software affect more than the learning curve: “Technology, computer hardware without the

necessary processing power; is a significant challenge, especially in our public schools where the use of computer labs is critical for required state proficiency examinations.” (Steven Branting).

Ruth Mostern is optimistic about the long-term prospects, however:

Too high a technology bar—this is a relatively small drawback, I think. Our expectations for student and teacher use of technology are a constantly moving target—we now expect powerpoint routinely, for instance, as well as a high level of facility with digital library tools, and I think it is reasonable to expect GIS to move into the category of routine tools.

There are some solutions to GIS training for history students, though these are painstaking, unrewarded, and specific to the situation of each institution. At my own university ([UC Merced](#)), I am still at an early stage of putting together the coalitions to make it possible, and although I expect ultimately to be successful, it is a difficult problem to get historians (and other humanists) interested in GIS and engineers and other power-GIS users educated about spatially aware humanities such that we can share resources and join forces.

Part of the answer to software issues lies in taking advantage of the increased array of software now available that is both inexpensive (or free!) and relatively easy to learn and use. The “cost” in using such software may be a loss of functionality at the higher end of one’s potential needs.

“As mentioned earlier, I (Jim Brown) went to Google Earth for its ease of 3-D imagery and its links with photographs via the Panoramio photo-sharing community -- even at the expense of giving up the layer attributes that ArcGIS and the older ArcView supports. Students can get it free. For my own use, all I need is the \$400/year Google Earth Pro package on my computer, for creating and measuring areas, for creating Paths, for canning “fly-bys” so as not to be dependent on internet hookup for presentations and for down-loading GPS data. Advanced files created on Google Earth Pro can be used on the free version. The Google Earth format .kml files, when compressed into .kmz formate (Google Earth folders) can be e-mailed as small attachments, so long as I don’t embed my own photographs in the files, greatly increasing their size (I can put the photos in Panoramio, if similar views don’t already exist).”



Nonetheless, the switch involved a significant trade-off:

The most important feature I gave up in switching from ArcGIS to Google Earth is the table of attributes one can create for any layer, and the sifting through that data for patterns. I hope that Google Earth will design a way to link to a spreadsheet and so open that feature to the general freeware public. It is a useful feature in ArcGIS that I know many people use to add data to display on their GIS maps. (ArcGIS requires the use of DBF format, but the functionality is similar to Excel.) In Google Earth Pro, under the Tools drop-down menu there is a Table tab – but it only has four simple categories – Name, Description (prose), Snippet, & Address. I haven't found any way to add categories to this list, or to query them the way you can in ArcGIS, even in the freeware ArcExplorer.

**Barry Robinson** points to “flexibility as to which software best serves the needs of the class seems to be key,” a point **Steven Branting** seconds. “GIS is a function-driven technology that can only operate within its programmed parameters. One has to be flexible and comfortable with adaptation to make GIS a good fit for whatever curriculum one has.”

**Physical Arrangements:** A core problem, only addressed in limited fashion in the rest of our discussion, concerns provision of an appropriate physical environment for pedagogical use of GIS in the history classroom. The use of GIS for many such purposes requires not only the availability of appropriate hardware for a teacher to use in a classroom (including data projector), but also space for students to actually use the technology. On college and university campuses, that typically means a computer lab – either a general lab or one specifically devoted to GIS use. The availability of a parallel facility In pre-collegiate schools there may be less access to such facilities, and their use will more likely have to be shared with other programs that may take greater priority. Even if the space is available, the sort of hardware available may have an impact on what GIS software can be run on its equipment. **Steven Branting's** situation may not be “average”, but it well illustrates the problem:

- One of the biggest problems I had in getting up and running was consistent access to a sufficient number of computer terminals. School computer labs are shared by the school as a whole and state proficiency examinations are computer-based, blocking out several weeks each term. Good advanced planning is necessary to ensure a regular training program so students do not become “stale” in their skills when we lack access to the lab. We attempt to engage our students in GIS work at least once a month. If teachers have classroom computers (even without

Internet drops), GIS can be a valuable application on stand-alone machines but this is only a limited solution that does not permit the same degree of student engagement with GIS as a computer lab.

- A second major problem lay in setting up computer labs (even when they had the proper hardware). This was initially a logistical problem until I began to use a remote download site prepared before the labs were brought on line. An example of this can be seen at the web site I use for the application My World: <http://www.lewiston.k12.id.us/staff/sbranting/myworld/my1.htm>

## V. On-Line Exemplars of Historical GIS

Although the sites noted here are not necessarily designed explicitly to serve course needs, many can be used that way in fact. In addition, even if you are not interested in using these particular resources in your own classrooms, exploring them will provide a good stimulus to your thinking about the possibilities of using GIS in the classroom.

Suggestions from **Steven Branting**:

5<sup>th</sup> Street Cemetery Necrogeographical Study [Several of our supplementary GIS projects are linked from this central portal. This project extended to arsenic leachate mapping in June 2008]: <http://www.lewiston.k12.id.us/staff/sbranting/5thcem/5thcem.htm>

*GIS for History* ("This site gives history students and teachers the power of GIS to investigate critical moments in American history."): <http://www.gisforhistory.org> (This is Josh Radinsky and Ben Loh's web site, materials from which are described in their article in our essay collection.)

The Historical GIS Research Network: <http://www.hgis.org.uk/> Links to a number of national GIS projects, training resources, handbooks, etc. European in focus.

**Ruth Mostern**:

The Electronic Cultural Atlas Initiative Cultural Atlas Portal links to a number of theme, region, and era specific GIS applications, some of which are, or can be, used in classroom environments.

The Valley of the Shadow remains one of my favorite examples of a thoughtful, historically meaningful and data rich digital atlas.

Vision of Britain is superlative, and it gets better all the time.

The China Historical GIS, does not have as much of an atlas infrastructure on top of the data as some of the other projects, and therefore requires more specialist expertise. For a brief description of the Google Earth Versions, see <http://www.h-net.org/announce/show.cgi?ID=162799>

Phil Brown adds:

**The Great Chicago Fire: The Web of Memory:** <http://www.chicagohs.org/fire/>. One of the first on-line museum exhibitions, this is designed for access by the general public and is therefore accessible to a wide range of age groups – lots of pictures, maps, etc.

**The Labyrinth: Resources for the Study of Medieval History:** <http://www8.georgetown.edu/departments/medieval/labyrinth/>. Includes among many other resources, access to geographic information.

**Ancient World Mapping Center:** <http://www.unc.edu/awmc/>

## VI. Further Reading/Research on Using GIS in the History Classroom.

What follows is a distillation of recommendations from our project authors for further reading. There was broad consensus on this list – a pretty strong recommendation from such a diverse group of scholars and practitioners!

For one perspective on what historians seek from GIS, see

Jack Owens, “What Historians Want from GIS,” *ArcNews Online* (Summer, 2007):

<http://www.esri.com/news/arcnews/summer07articles/what-historians-want.html>.

Steven Branting has published extensively on how pre-college level coursework can be developed, but of potential interest to all:

Branting, Steven D. (2009) "Digitizing a Heritage of Faded Memories — A Case Study on Extending Historical Research Capabilities." *The History Teacher*. 42:4. Long Beach CA: Society of History Education.<sup>1</sup>

\_\_\_\_\_ (2008) "Hic Sunt Dracones." *Journal of the Association for Computing and History*. XI:2

\_\_\_\_\_ (2009) "Calling Off the Hunt for the Snark." *URISA News*. January/February.

\_\_\_\_\_ (2009) "Qua Vado Illic Es: A Quest for Spatial Literacy." *V1 Magazine*. December.

It is a comprehensive case study using the national standards for historical research as benchmarks in the context of a GIS/digital project for middle and secondary school students.

George Daley's white paper for ESRI is also geared toward pre-collegiate use of GIS in the social studies/history classroom:

Daley, George. "Geohistorical Inquiry: Connecting Place and Time and Critical Thinking." [online, PDF]  
<http://www.esri.com/industries/k-12/download/docs/geohistorical.pdf>

In terms of graduate teaching and GIS, see:

J.B. Owens and Laura Woodworth-Ney (2005) "Envisioning a Master's Degree Program in Geographically-Integrated History" *Journal of the Association for History and Computing* [Vol VIII, Num 2, September](#) The article presents the underlying vision of the master's degree program in Historical Resources Management that authors designed for the History Department of Idaho State University. The program began in the fall of 2007. The authors envision a curriculum with a "spatial emphasis" that will graduate historians with strong traditional training and the capability of using digital techniques, particularly Geographic Information Systems or GIS, for their work.

Two broad-ranging collections of essays, highly recommended by many of our participants, provide readable, widely available introductions to the use of GIS in historical and related social science scholarship. Some of this material will stimulate your thinking about teaching even though, as our discussions emphasized, there is almost nothing per se on the use of GIS in the classroom.

Knowles Anne Kelly and Amy Hillier. (2008) *Placing History: How GIS is changing historical scholarship*. Redlands CA: ESRI Press. A digital supplement to this edited by A. Hillier is also available.

Knowles Anne Kelly (2002, ed.) *Past Time, Past Place: GIS for history*. Redlands, CA: ESRI Press.

For methodological introductions to using GIS in historical research, two versions of one of the pioneering works are available for free download:

Gregory Ian.N. (2003) *A Place in History: A guide to using GIS in historical research*. Oxbow: Oxford.

- The second edition of this is available online at:  
<http://www.ccsr.ac.uk/methods/publications/ig-gis.pdf>
- the first edition is available from  
<http://hds.essex.ac.uk/g2gp/gis/index.asp>

Gregory Ian.N. and Ell Paul.S. (2007) *Historical GIS: Techniques, methodologies and scholarship*. Cambridge: Cambridge University Press, provides a hardbound, updated and expanded introduction to the use of GIS in historical work and includes a section on accessing data on the internet.

Those with an interest in a more detailed overview of representing time in GIS as seen from a geographer's perspective will find Ott, Thomas. and Frank Swiaczny (2001) *Time-Integrative Geographic Information Systems: Management and analysis of spatio-temporal data*. Berlin: Springer Verlag, very useful.

Ruth Mostern notes, "I recommend some readings about digital gazetteers. For many historical projects, which are place-name focused more than they are location focused, gazetteers are an invaluable tool. This is particularly true for the many historical topics for which no spatial data currently exists. The most important book is Linda Hill, *Georeferencing: The Geographic Associations of Information* (MIT, 2006). I have recently written an article about gazetteers for history. While it is not classroom focused, it may be useful, and it points to more useful publications in the bibliography: Ruth Mostern, "Historical Gazetteers: An Experiential Perspective, With Examples from Chinese History," *Historical Methods* 41.1 (2008)."

## **VII. Data Sources and Recommendations**

## Good Sources of Data

Steven Branting has posted a number of lesson plans for various courses (not just history/social studies courses) that can be used as models for people as they develop their own lessons and courses using GIS:

<http://www.lewiston.k12.id.us/staff/sbranting/myworld/my7.htm>

For a start on getting maps and related data, Steven Branting suggests the following:

- **ESRI Data:** <http://www.esri.com/data/index.html>
- **Geography Network:** <http://www.geographynetwork.com/data/index.html>
- **MapCruzin:** [http://www.mapcruzin.com/download\\_mapcruz.htm](http://www.mapcruzin.com/download_mapcruz.htm)
- **Electronic Cultural Atlas Initiative** [Cultural Atlas Portal](#)
- **Google Earth Community.**

**Ruth Mostern** also notes: Most history textbooks now come with slightly interactive maps (a bit of Flash illustrating something like, say, the campaigns of Alexander the Great) as well as many in-text maps. I have used both the interactive maps and the text maps from **Bentley and Ziegler's *Traditions and Encounters*** with great effect. I assign all of my world history students to buy the ***DK World History Atlas***, and I swear by it. It is fantastic and will not be superseded by any digital resource any time soon. I do not plan any history lecture without Googling for maps, and I always find them – archaeological site plans, historical maps of cities, maps of empires. Few to none of these are GIS resources per se, but all add a spatial dimension to history classes.

**Jim Brown** strongly echoes Ruth's comments on Google Earth Community, and the rewards of Googling for maps. "Often when trying to locate some historical site on Google Earth – the path of Hitler's "Beer Hall Putsch" march across Munich, the various tea museums in the Chang Jiang valley, the statue of Oom Paul Kruger in Pretoria – I have just framed the general view in Google Earth and typed in those words, and popped open a list of GE Community sites already embedded in the GE surface. (A GIS layer, whether in ArcGIS, ArcView, Google Earth, or other, is a great place to embed websites such as Encyclopedia Britannica's animated presentation of the Schlieffen Plan for WWI, both in conception and as it came off. In Google Earth your basic layer can frame the general map – any azimuth or viewing angle or close up – to showcase the website to best advantage. Further, I almost always do a Google – Images search on the topic, and embed the websites for such images in a Folder, Placemark, Path or Polygon layer in the Google Earth map along with my explanatory text.)

Paper maps can be scanned readily and imported into a GIS for use. In addition to digital materials, Ruth Mostern, Phil Brown, Steven Branting, Jim Brown and others

have often used the georeferencing tool in ArcGIS to assign appropriate latitude and longitude coordinates to scanned map images. The process is quite straight-forward. As **Steve Branting** explains:

“Vintage maps converted to .tiff image files can be rectified to current data points (e.g., parcel boundaries). For example, we use Sanborn Fire Insurance maps from 1900 to demonstrate where houses and other structures sat on lots in a neighborhood. (That process can be compared to building shapefiles, a common format for GIS software use.) The technique is very simple; I have authored a new article to tutor faculty members and provide a unit to present to teach students how to georeference and image.

Access the lesson from ESRI at [http://gis.esri.com/industries/education/arclessons/search\\_results.cfm?id=256](http://gis.esri.com/industries/education/arclessons/search_results.cfm?id=256)

### **Increasing the Availability of Data**

“We need to work with publishers and foundations to make it possible to develop and disseminate the most valuable spatial data possible, so that we don’t have to build it all from scratch.” (**Ruth Mostern**).

Even as we encourage publishers and others to develop certain sets of data that can not be readily created by an individual or small groups, “there ought to be multiple illustrations of how locally-generated GPS data, at least in the form of points and routes, can be downloaded into a general GIS program such as ArcView, ArcGIS or Google Earth. Although most of my work has been in world history, I suspect the use of relatively cheap handheld GPS units on the local level will be one of the most enthusiastically embraced aspects of GIS in the history classroom of the future.” (**Jim Brown**)

**Barry Robinson** takes a somewhat different position: “I agree with Ruth that the more content becomes available the better, but (at least in my upper-level courses) I’d actually prefer that my students develop their own data, so content is less of an issue.”

**Philip Brown** senses that regional/national field of concentration makes a big difference in what kinds of data students can generate on their own. Anything dependent on field work is out of the question for a student in a survey of East Asian civilization class or even advanced classes in that field, but not for someone doing American/local history. Field may even make a difference if students are just culling information and organizing it from web sites – what is available about Japan, for

example, is often in Japanese, not English, and the range of data available to students is thus more restricted than for the English-speaking world.